USER'S MANUAL
INGECON® SUN PLANNER

AAX2005IKL02_

Ingeteam Energy S.A

2009-10-28

Index

Page

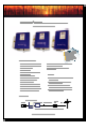
Related documentation

CATÁLOGOS



Catálogo Comercial Ingecon Sun

AAP0000IFA



Catálogo Técnico Ingecon Sun Monofásicos

AAP2001IFA01



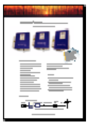
Catálogo Técnico Ingecon Sun Trifásicos

AAS2001IFA01
AAS2001IFA02



Catálogo Técnico Comunicaciones

AAP2002IFA01



Catálogo Técnico Ingecon Sun Monofásicos

AAP2001IFA02



Catálogo Técnico Ingecon Sun Hybrid

AAR2001IFA01
AAR2001IFA02



Catálogo Técnico Ingecon Sun Monitor

AAP2005IFA01

MANUALES



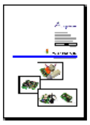
Manual de Instalación Ingecon Sun Monofásicos

AAP2000IKH01



Manual de Instalación Ingecon Sun Trifásicos

AAS2000IKH01



Manual de Instalación de Accesorios Comunicación

AAP2002IKH



Manual de Instalación Ingecon Hybrid

AAR2000IKH01



Manual de Usuario Ingecon Sun Monofásicos

AAP2000IKE01



Manual de Usuario Ingecon Sun Trifásicos

AAS2000IKE01



Manual de Usuario Software de Monitorización

AAP2002IKE01



Manual de Usuario Ingecon Hybrid

AAR2000IKE01



Manual de Usuario Ingecon Hybrid Monitor

AAR2002IKE02

1. INTRODUCTION

This document refers to the PC program:

Ingecon®Sun Planner

The Ingecon® Sun Planner software has been conceived to serve as a design guide for those users responsible for sizing grid-connected PV systems incorporating Ingecon® Sun inverters.

1.1 Hardware and Software requirements

To use Ingecon® Sun the following are required:

- PC with the Windows® XP operating system.
- Adobe Acrobat 7.0 or higher.

1.2 Usage regulations

Copyright

The Ingecon® Sun Planner software is the property of Ingeteam, S.A.

IMPORTANT	**Ingeteam is not liable for any direct or indirect damage caused by the use of this program.**

2. INSTALLATION.

The software shall be installed via the Internet.

The installation process is as follows:

1. Download the software from the Ingeteam website (**www.ingeteam.es** or **www.ingeteam.com**).
2. Execute file Setup.exe and commence installation.
3. Follow the installation instructions given.



3. ICONS AND LANGUAGES.

ICONS

The following icons appear in the Ingecon® Sun Planner main menu:



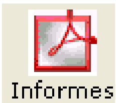
(New) To create a new project.



(Open) To open an earlier project that has already been saved.



(Save) To save the current project on the selected path.



(Reports) To generate a report in pdf format.

Click on "informe" (report) to open a text box to save the data to the selected path.

Ingeteam Click on this icon for a drop down user help menu.



LANGUAGES



Click on the appropriate flag to select the desired language for the Ingecon® Sun Planner. The following languages are available:

- Spanish, English, German, Italian and French.

4. PV SYSTEM DESIGN WITH THE INGECON® SUN PLANNER

The aim of the Ingecon® Sun Planner is to automatically provide the PV configuration that is best suited to the Ingecon ® Sun inverter selected, based on the operating conditions indicated in the following table.

Extreme operating temperatures	Irradiance
Cell temperature from **-10°C** to **+70°C**	**1000 W/m2**

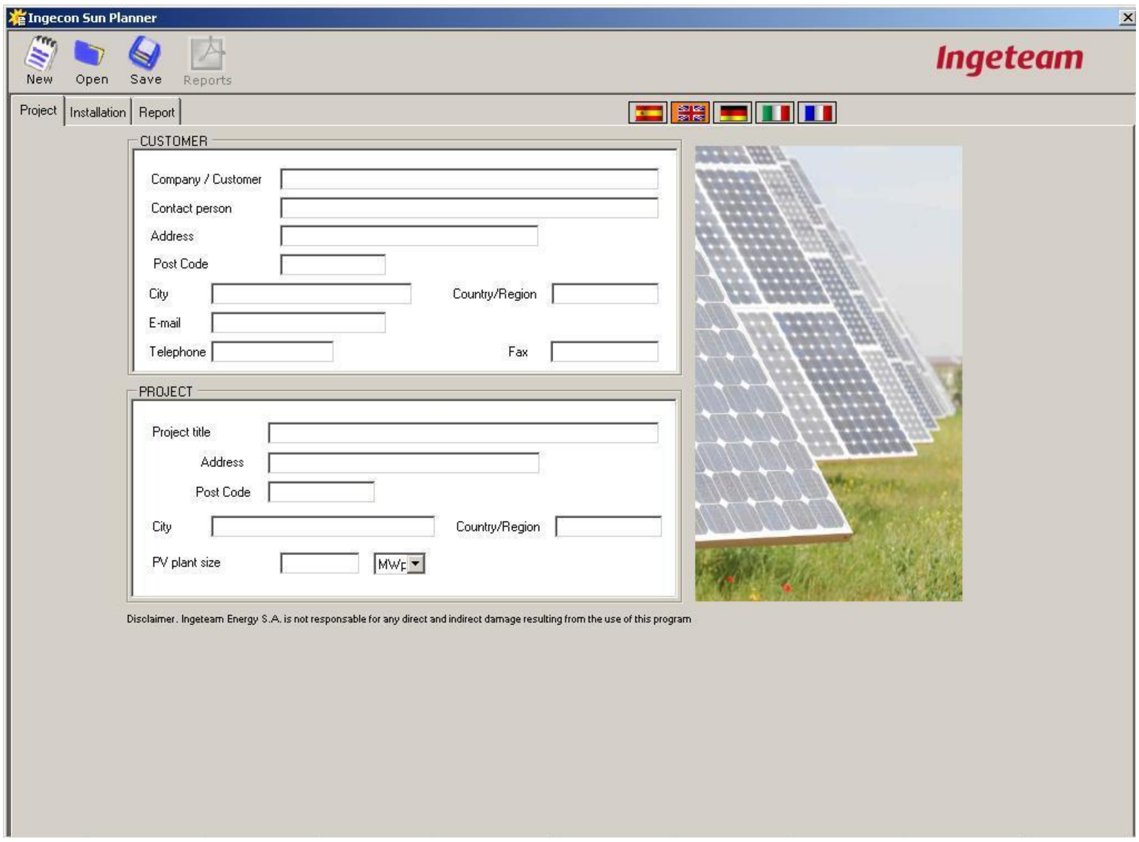
Although the software proposes a PV system configuration, the user also has the possibility of manually creating an alternative solution, and can modify the extreme operating temperatures and decide whether the system voltage and current values are adequate. However, it is only possible to analyse the performance of module configurations for irradiance levels of 1000 W/m2.

IMPORTANT	***When designing the PV system, the user should also take into account any specific characteristics of the PV system in question given the fact that the system automatically sized by the Ingecon® Sun Planner does not do so. Such characteristics include: voltage drops along the wiring, shadows, system cooling, length, latitude and PV array tilt angle.***

5. PROJECT PROCESS.

5.1. Project

The "Proyecto" or Project tab offers the possibility of customising the grid-connected PV system design for each customer and project. However, for the PV system sizing, completion of the fields under this tab is optional; it is therefore possible to go directly to the "Instalación" or system tab, if desired.

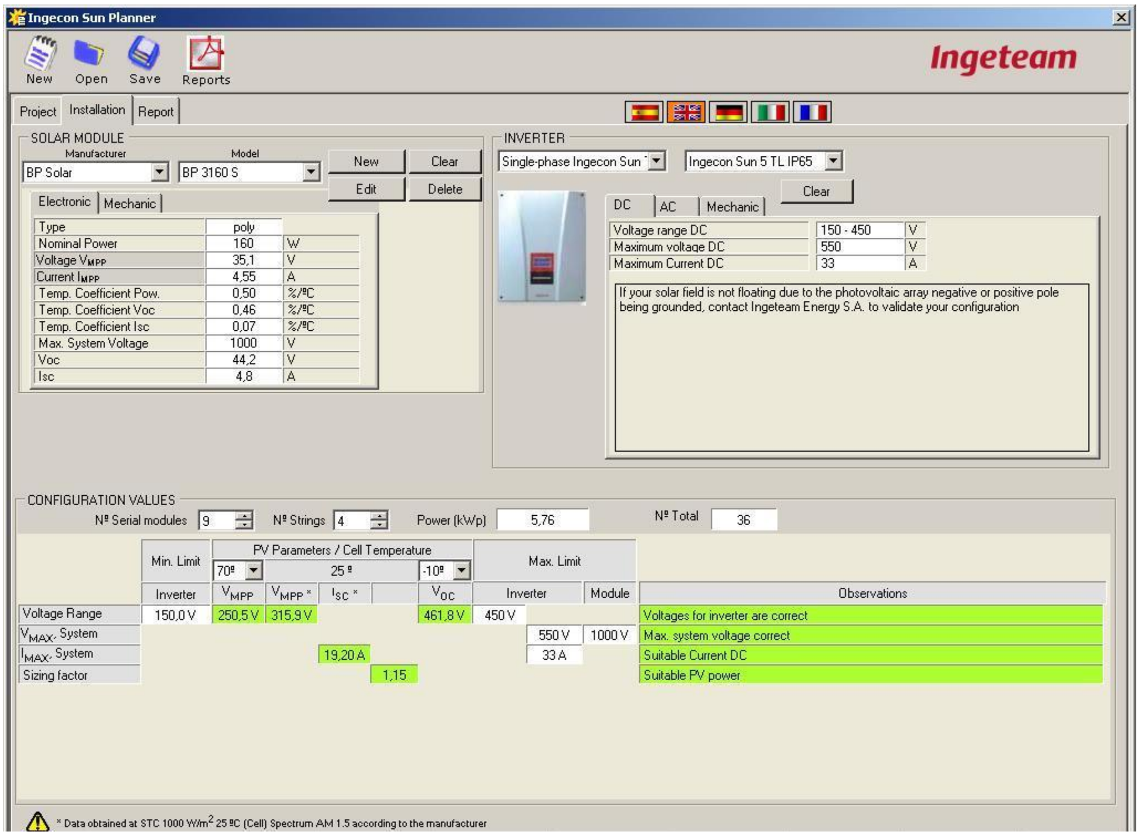


The user is completely free to solely fill in those fields desired or considered advisable. There are no mandatory fields to be completed.

5.2. System.

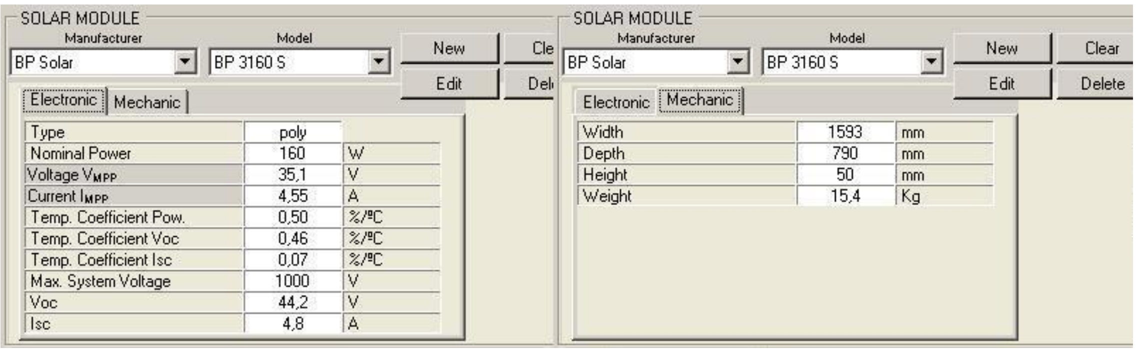
It is possible to distinguish three different areas within the "Instalación" or system tab:

- Solar module.
- Inverter
- Configuration values.



SOLAR MODULE

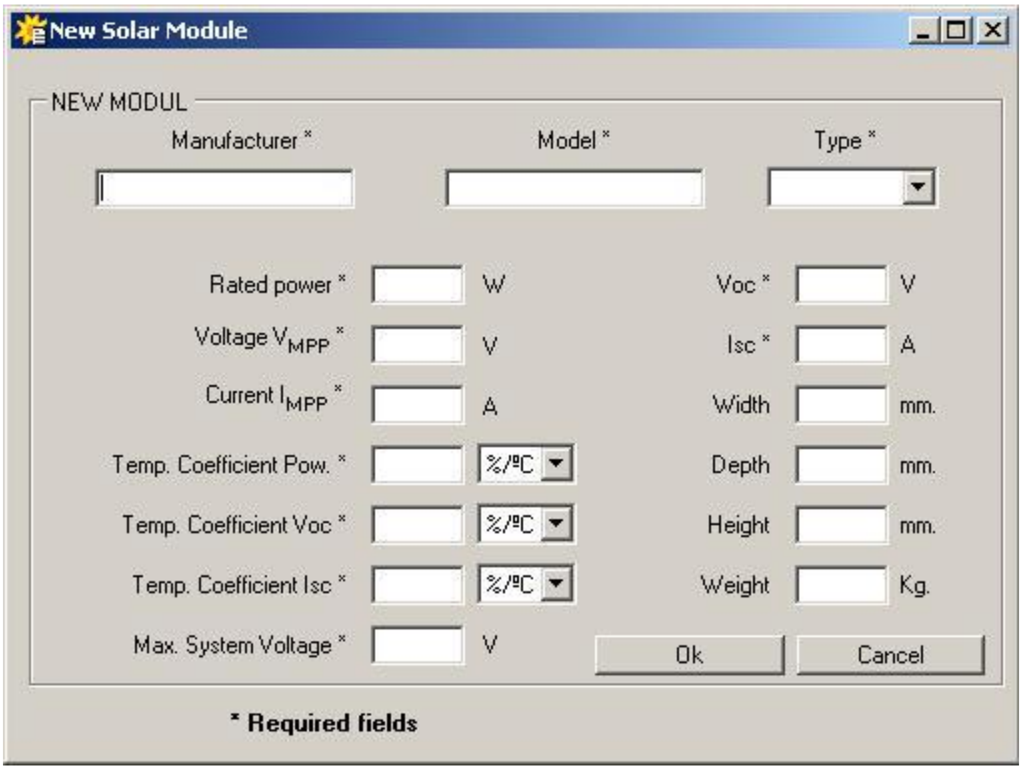
The "módulo solar" or solar module area displays the electrical and mechanical characteristics of the solar modules. As can be seen in the following figure, there is a tab to select the type of characteristics to be displayed. By default, the PV module electrical characteristics are shown.



The Ingecon® Sun Planner incorporates a database which includes the different module models available on the PV sector market.

Due to the ongoing growth of the PV sector, the Ingecon® Sun Planner database could possibly become outdated. To overcome this problem, database updates can be downloaded when the button is enabled with the text "Hay una versión más reciente en la base de datos" (There is a more recent version in the database). For system sizing with a model not included in the database, this new model can be incorporated using the buttons available in the solar module section. These buttons have the following functionalities:

- ***New:*** New. To add a new module to the database.



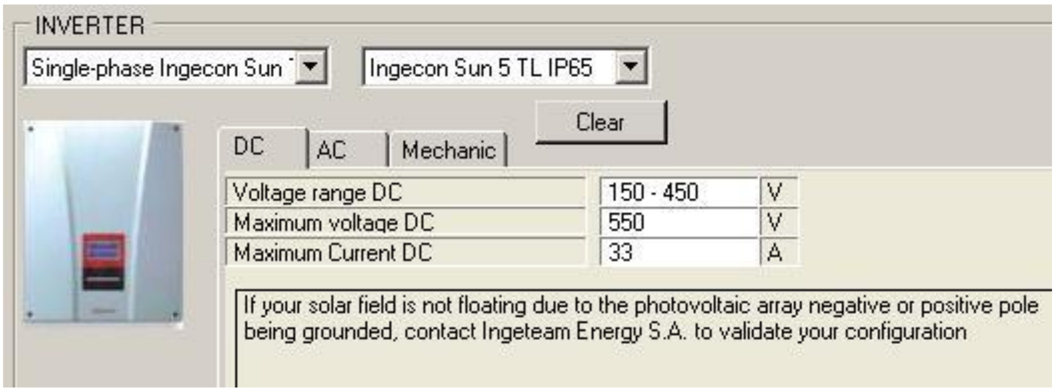
IMPORTANT	***The fields: "Coeficiente de temp.Pot", "Coeficiente de temp.Voc"* and *"Coeficiente de temp.Isc"* are, respectively, the temperature coefficients for: Power; open circuit voltage; and short-circuit current. All these coefficients should be entered as an absolute value, in other words, with no sign.**

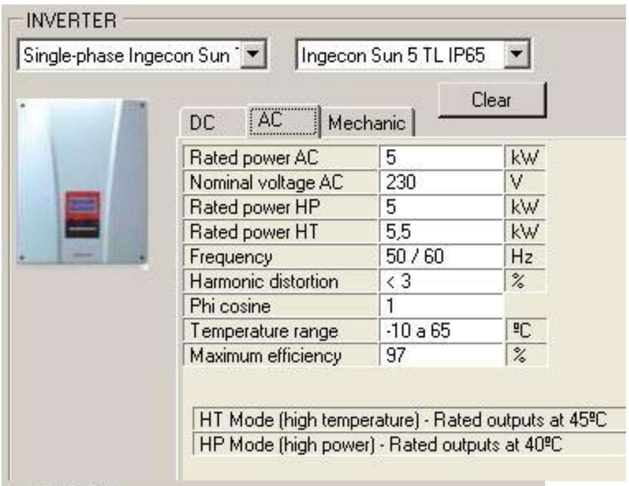
- ***Edit:*** Edit. To modify any of the electrical or mechanical characteristics of any PV module.
- ***Clear:*** Clear. To delete the data appearing on the screen associated with the solar module.
- ***Delete:*** Delete. To delete the selected module from the database.

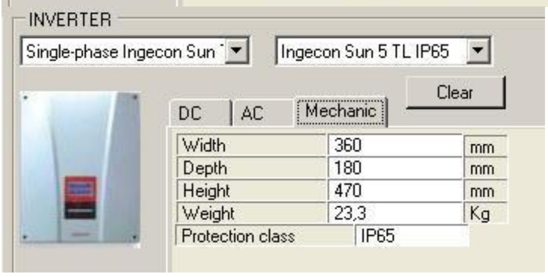
INVERTER

In the "Iinversor" or inverter area, the Ingecon® Sun inverter desired for the PV system is selected. The inverter characteristics are then shown: the "DC" and "AC" tabs for the electrical characteristics and the "Mecánica" tab for the mechanical characteristics.

To delete the data associated with the Inverter section of the screen, click on the clear button: ***Clear***.







If you look at the figures above, in the figure showing the inverter DC information, the following warning message appears:

> "Si su campo solar no es flotante por conexión a tierra del polo positivo o del polo negativo del campo fotovoltaico, contacte con INGETEAM ENERGY S.A para validar su configuración" (If your solar field is not floating due to the PV array negative or positive pole being grounded, contact INGETEAM ENERGY SA in order to validate your configuration).

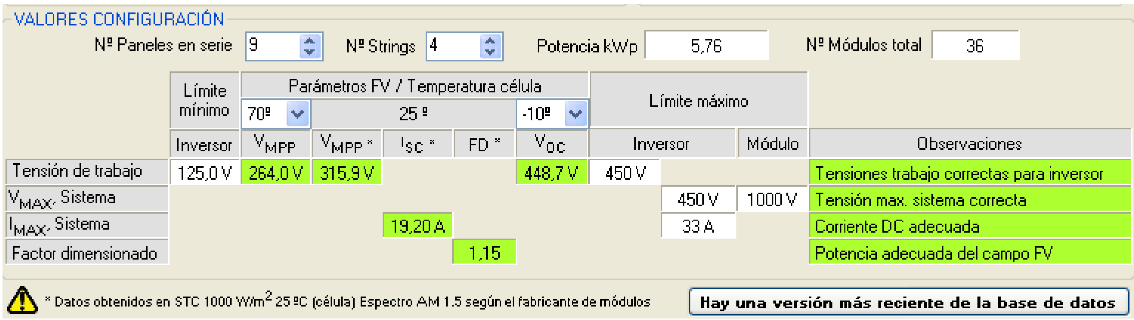
For correct operation, some solar modules need to have their positive pole or negative pole grounded. When this connection is made, the PV array is no longer floating.

If the module specifications require a non-floating connection for the solar array, then the Ingecon® Sun inverters require an additional kit that is not included with the equipment and must be requested from Ingeteam S.A. For this reason, the above mentioned warning message indicates that it is necessary to contact Ingeteam S.A.

The Ingecon® Sun Planner does not include the data sheets provided by the solar module manufacturers and which indicate whether the solar array should have a non floating configuration.

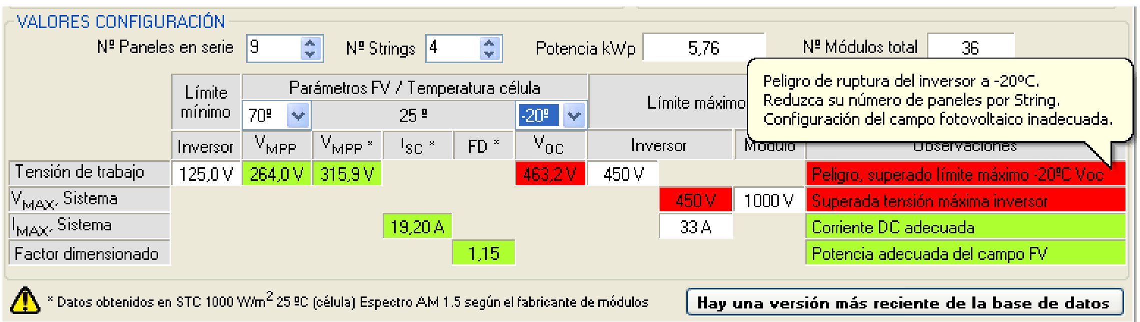
CONFIGURATION VALUES.

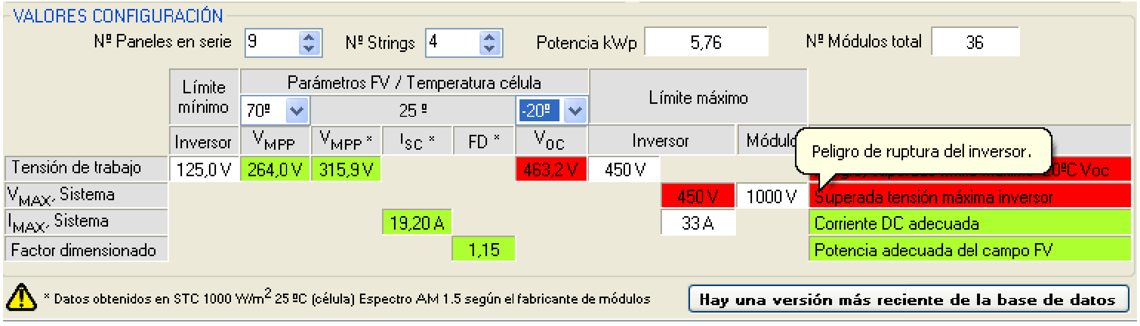
A PV array configuration automatically appears once the panel has been selected in the SOLAR MODULE area and the Ingecon® Sun inverter has been selected in the INVERTER area, or vice versa. The figure below shows an example of a configuration automatically made by an Ingecon® Sun 5.



Although the Ingecon® Sun Planner gives a PV array configuration by default, the user always has the possibility of modifying the number of panels connected in series and the number of strings, in addition to the extreme temperature conditions for which the system is to be sized, which by default are for a solar module cell temperature ranging from + 70°C to - 10°C.

For any configuration whatsoever, whether given by default by the Ingecon® Sun Planner or user-created, the "Observaciones" or observations section provides an analysis of the quantities of various PV array variables, indicating whether there is any possibility of damaging the PV modules and / or the inverter. Below it is possible to see how, when the extreme design temperature for the cell is changed to -20°C, for the configuration of the figure shown above, a message appears indicating that this situation would cause damage to the inverter.

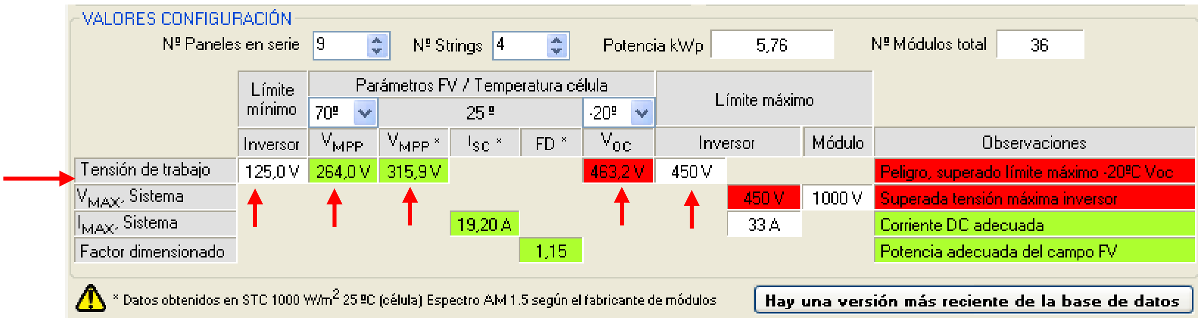




As can be seen in the two figures above, in addition to the comments which appear in the observations table, more detailed information is also provided as to the potential repercussions that the various parameter quantities could have on the inverter in the specific PV system sizing.

⚠ **IMPORTANT**	***In the observations section, in order to see whether there is any additional information for any of the PV system parameters, move the mouse pointer over the comments. The information shown for the PV system parameters can range from recommendations to improve the system operation to messages warning of the possibility of damaging the modules or the inverter.***

Provided below is an explanation of each of the parameters indicated in the valuation table. In order to read the table correctly, it should always be read in two directions. For each line, read the enabled columns as shown below.



<u>Tensión de trabajo – operating voltage</u>

This line indicates the PV array operating voltages.

Starting from left to right, the information enabled in this line is:

Limite mínimo inversor - ***Minimum inverter limit:*** This parameter indicates the minimum value of the MPP voltage range for the inverter.

VMPP +70ºC: This is the MPP voltage shown by the PV system sized at a cell temperature of 70ºC and 1000 W/m2. It is possible to analyse the MPP voltage for a value other than + 70ºC for the cell, which is the value given by default by the Ingecon® Sun Planner for the automatic configuration.

VMPP +25ºC: MPP voltage of PV system sized at a cell temperature of 25 ºC for and 1000 W/m2.

Voc -10ºC: This is the open circuit voltage shown by the PV system sized at a cell temperature of -10 ºC and 1000 W/m2. As can be seen in the table, it is possible to analyse the open circuit voltage Voc for a cell temperature value other than -10 ºC , which is the value given by default by the Ingecon® Sun Planner for the automatic configuration.

Límite máximo - Maximum limit: This column is sub-divided into the Inverter and module. This sub-division enabled will show the most restrictive voltage value in order not to damage the module or inverter.

Observaciones - Observations: A check is made of the PV system values: VMPP+70ºC, VMPP+25ºC, and Voc -10ºC to ensure their adequacy. Should different temperature conditions be taken for the extreme values, such as, VMPP+80ºC and Voc -20ºC, the observations are also made for these operating conditions.

Vmax, Sistema – Vmax, System

This line checks that the PV array configuration does not have a voltage that could damage the PV modules or the inverter.

Límite máximo – maximum limit: This is subdivided into Inverter and Module. In this case, the maximum voltage values are given, going upwards, that the PV system elements can withstand, in other words the module and inverter, or vice versa.

Observaciones - observations: A check is made to ensure that the PV system is within the maximum voltage limits of the elements making up the system.

Imax, Sistema – Imax, System

The line corresponding to Imax, System is responsible for analysing the direct current value which the PV array delivers to the inverter.

Imax,Sistema – Imax System: This parameter indicates the short-circuit current of the PV array at a cell temperature of 25ºC and 1000 W/m2.

Observaciones - observations: The idea of the Imax, System line is to verify that at conditions of 25ºC and 1000 W/m2 the maximum permitted PV inverter input current is not exceeded.

Factor dimensionado - Sizing factor

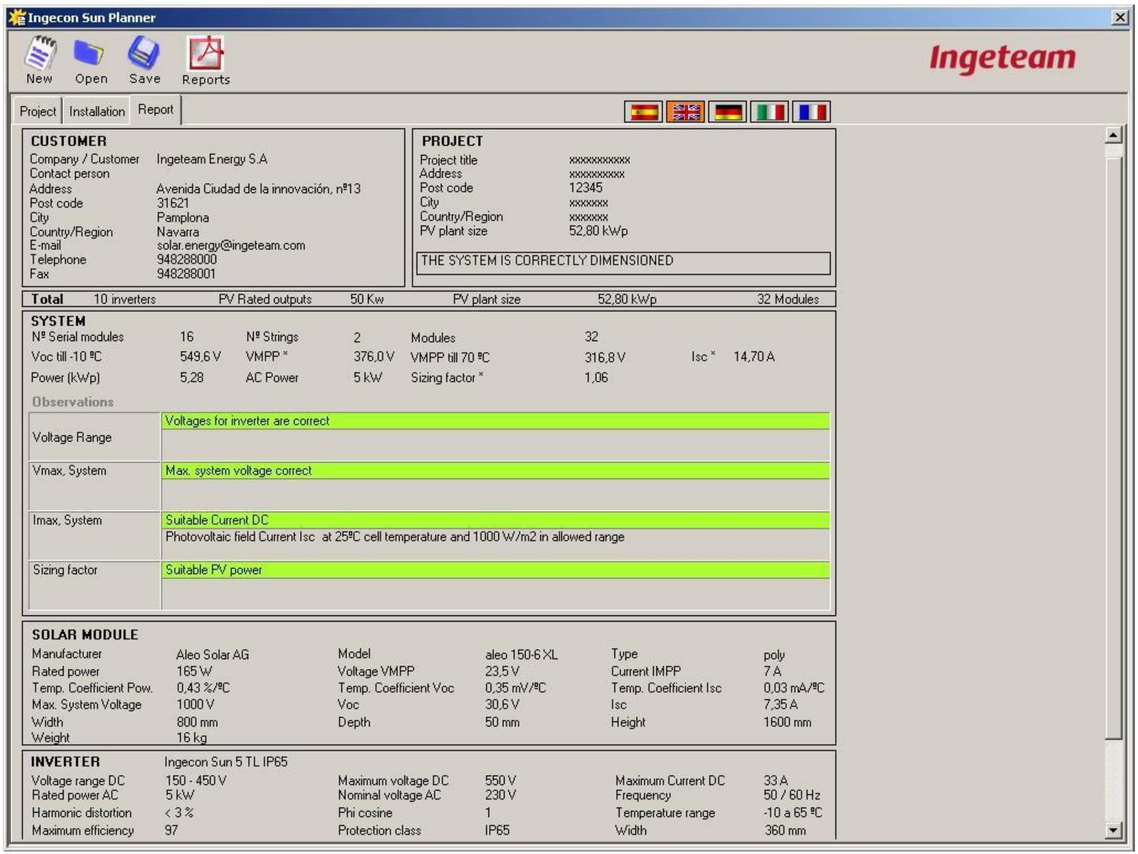
In the Ingecon® Sun Planner, the sizing factor line aims to show the ratio between the size of the PV system and the rated power of the Ingecon® Sun inverter used.

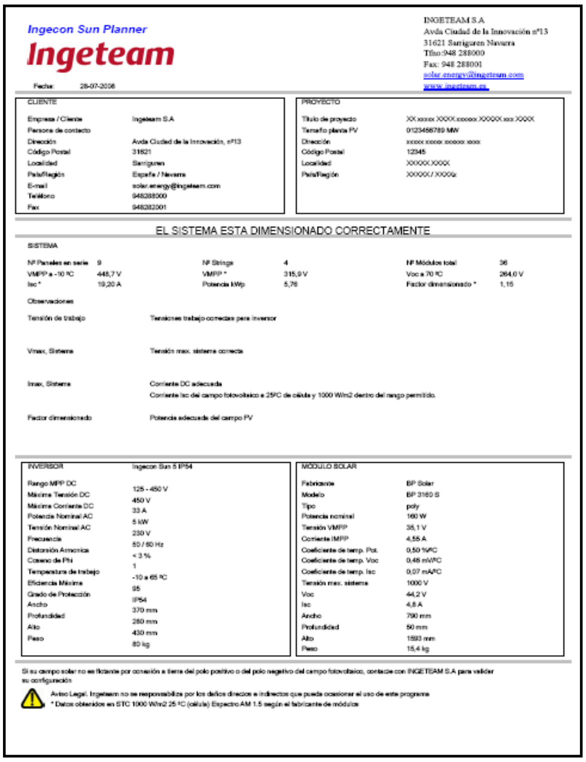
Factor dimensionad0 - Sizing factor: The sizing factor (FD) is defined as the ratio between the peak power of the PV array at a cell temperature of 25 ºC and 1000 w/m2 and the AC rated power of the inverter.

Observaciones - observations: Here the FD value is analysed in order to avoid excessively high or low values.

5.3. Informe - Report.

The report tab displays a compilation of the information provided under the Project and System tabs. By clicking on the "Informes" or report icon in the main menu, a PDF document is generated with all the information appearing on screen with regard to the configuration of the PV system obtained.


Ingecon Sun Planner
New
Open
Save
Reports
Ingeteam
Project
Installation
Report
CUSTOMER
Company / Customer
Ingeteam Energy S.A
Contact person
Address
Avenida Ciudad de la innovación, nº13
Post code
31621
City
Pamplona
Country/Region
Navarra
E-mail
solar.energy@ingeteam.com
Telephone
948288000
Fax
948288001
PROJECT
Project title
Address
Post code
12345
City
Country/Region
PV plant size
52,80 kWp
THE SYSTEM IS CORRECTLY DIMENSIONED
Total
10 inverters
PV Rated outputs
50 Kw
PV plant size
52,80 kWp
32 Modules
SYSTEM
Nº Serial modules
16
Nº Strings
2
Modules
32
Voc till -10 ºC
549,6 V
VMPP *
376,0 V
VMPP till 70 ºC
316,8 V
Isc *
14,70 A
Power (kWp)
5,28
AC Power
5 kW
Sizing factor *
1,06
Observations
Voltage Range
Voltages for inverter are correct
Vmax, System
Max. system voltage correct
Imax, System
Suitable Current DC
Photovoltaic field Current Isc at 25ºC cell temperature and 1000 W/m2 in allowed range
Sizing factor
Suitable PV power
SOLAR MODULE
Manufacturer
Aleo Solar AG
Model
aleo 150-6 XL
Type
poly
Rated power
165 W
Voltage VMPP
23,5 V
Current IMPP
7 A
Temp. Coefficient Pow.
0,43 %/ºC
Temp. Coefficient Voc
0,35 mV/ºC
Temp. Coefficient Isc
0,03 mA/ºC
Max. System Voltage
1000 V
Voc
30,6 V
Isc
7,35 A
Width
800 mm
Depth
50 mm
Height
1600 mm
Weight
16 kg
INVERTER
Ingecon Sun 5 TL IP65
Voltage range DC
150 - 450 V
Maximum voltage DC
550 V
Maximum Current DC
33 A
Rated power AC
5 kW
Nominal voltage AC
230 V
Frequency
50 / 60 Hz
Harmonic distortion
< 3 %
Phi cosine
1
Temperature range
-10 a 65 ºC
Maximum efficiency
97
Protection class
IP65
Width
360 mm


Ingecon Sun Planner
Ingeteam
INGETEAM S.A
Avda Ciudad de la Innovación nº13
31621 Sarriguren Navarra
Tfno:948 288000
Fax: 948 288001
solar.energy@ingeteam.com
www.ingeteam.es
EL SISTEMA ESTA DIMENSIONADO CORRECTAMENTE

6. PV PANEL DATABASE.

The technical data for the PV modules included in the Ingecon® Sun Planner were obtained from the Solar Module 2008 Professional database of the Photon magazine. Ingeteam is in no way liable for any data inaccuracy.

Avda. Ciudad de la Innovación, 13
31621 Sarriguren (Navarra)
Tel +34-948 288 800
Fax +34-948 288 801
http://www.ingeteam.com